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Biosecurity Code of Practice for Indoor Pigs

PHCBSCODEOFPRACT OCTOBER 2023

Executive Summary of the Code of Practice for Biosecurity for Indoor Pigs

Definition of Biosecurity

Biosecurity is a set of preventative practices designed to reduce the risk of introduction and spread of disease agents. It can be subdivided into two main components: **external biosecurity or bio-exclusion** which is aimed at keeping pathogens out of the herd; and **internal biosecurity or bio-management** which focuses on preventing the spread of pathogens within herd.

Level 1 or Routine biosecurity procedures comprise procedures that should be implemented and followed on a daily basis.

Level 2 Enhanced biosecurity procedures are for high risk contingency situations such as the introduction of an exotic or emergent disease (e.g. introduction of African Swine Fever).

Transmission of Disease

The most common route of disease transmission is through animals that are either showing signs of disease or carrying disease without showing any signs. Therefore, many biosecurity procedures, whether for external or internal biosecurity, are focussed on limiting spread through movement of pigs, domestic animals, humans or wildlife/vermin. Other procedures such as cleaning and disinfection focus on preventing spread through exposure to contaminated environments or equipment.

Routine External Biosecurity Procedures

The risk of introduction of infectious agents can be reduced by:

- ✓ Limiting the number of occasions on which animals are introduced to the herd and reducing the total number of animals introduced as much as possible.
- ✓ Ensuring adequate quarantine procedures are in place if animals are introduced into the herd.
- ✓ Only purchasing semen from boars with high health status.
- ✓ Implementing procedures for handling, temporary/final storage and removal of dead pigs to prevent any contamination of feed and water sources, housing areas and/or the external environment (e.g. maintaining covered leak-proof containers located outside of production area).
- ✓ Collecting, containing and using manure away from the herd or animal groups and in a manner that prevents access to scavengers and pests. It should be spread preferably on land away from pig farms (ideally tillage and if not, grassland).
- ✓ Maintaining strict policies for visitors (e.g. limiting numbers as much as possible, providing farm clothes and shoes, hygiene lock).
- ✓ Providing staff with clean farm-specific clothing/footwear.
- ✓ Implementation of strict procedures to exclude vermin of any kind.
- ✓ Separation of clean and dirty areas of the farm and ensuring all incoming vehicles are adequately cleaned and disinfected.
- ✓ Preventing introduction of pathogens through equipment (e.g. disinfection of shared equipment), feed, water (e.g. ensure pigs only have access to clean drinking water) or bedding/enrichment materials.

Routine Internal Biosecurity Procedures

Preventing spread of infectious agents within the herd can be reduced by the following measures:

- ✓ Maintain excellent management practices to ensure animals remain healthy.
- ✓ One-way pig flow: never mix pigs of different ages, operate houses on an all-in all-out basis.
- ✓ Always move sick pigs to a recovery pen. Euthanise sick, lingering and injured pigs not likely to recover. Only use its own dedicated equipment in the recovery pen.
- ✓ Have a working protocol to look after younger animals first, then older animals. Look after healthy animals before checking on sick animals.
- ✓ Reduce mixing of litters/groups as much as possible.
- ✓ Provide adequate space for animals to thrive.
- ✓ Ideally needleless injectors or single use needles should be used; however, if not possible, all multiple needle use should be confined to a single needle per litter or single needle per pen.
- ✓ Limit cross-fostering to one occasion and within the first 48 hours after birth.
- ✓ Provide section specific equipment, clothing and footwear (preferably with a unique colour for every section).
- ✓ Install hand washing/boot washing facilities throughout the farm and between sections.
- ✓ Clean, wash, dry, disinfect and dry animal pens and equipment, including feeders and drinkers, before pigs are introduced into the facilities / different areas of the unit.

Enhanced Biosecurity Procedures

- ✓ No visitors are to enter the production area unless absolutely essential (e.g. veterinarian, essential maintenance staff).
- ✓ Essential visits—head-to-toe shower before and after visit. A complete change of clothes and footwear, is required; hair covering and breathing protection must be worn. Used clothing and all used personal protection equipment must remain on the property.
- ✓ Any vehicles which enter the property must be washed and disinfected at the wash pad (or appropriate area) on entry or exit, e.g. feed lorries, etc. The inside of vehicle driver cabins must also be sanitised.
- ✓ DAFM must be contacted immediately in the event of a suspected outbreak of a notifiable disease. Where a notifiable disease is suspected no people, animals, manure, equipment or any other thing capable of spreading disease should be allowed on or off the premises until an investigation led by DAFM has been conducted. All DAFM instructions must be followed.
- ✓ Any necessary movements of personnel, equipment or feed onto a site potentially infected with an exotic notifiable disease must be pre-authorised by DAFM and moved under licence subject to stringent biosecurity procedures.

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Keeping Animals Safe from Disease: A National Farmed Animal Biosecurity Strategy (NFABS) (2021-2024)

This strategy builds on many of the key principles of the Department of Agriculture Food and the Marine's (DAFM) National Farmed Animal Health Strategy (NFAHS) (2017-2022), which emphasised the need to work in partnership, to acknowledge roles and responsibilities, to reflect costs and benefits, and to shift the focus from disease control and treatment to disease prevention. Keeping the animals in our national herds and flocks safe from disease – starting inside the farm gate- is an integral part of the 'One Health One Welfare' approach. An ambitious but achievable pathway is put forward in NFABS (2021-2024), placing biosecurity front and centre in the plan for the success and sustainability of Irish livestock farming.

The good health status of our farmed animals is fundamental in underpinning the continued success of the Irish livestock sector. The ability to raise our defences in the face of a specific threat [such as African Swine Fever (ASF)] is important, but it is equally important that effective, routine farm biosecurity practices are put in place and are practised consistently every day of the year, whether or not a specific disease threat has been identified. When good biosecurity practices are in place on farm and when they are implemented routinely and effectively, they reduce the risk of introducing disease into, and of spreading it within, the farm. The level of risk reduction will be determined by how effectively and routinely good biosecurity measures are implemented and practised.

The NFABS strategy outlines a vision of what an effective farmed animal biosecurity strategy in Ireland could look like. Six broad strategic actions, considered central to the successful implementation of this strategy, are outlined, grouped into 3 areas (Awareness, Knowledge and Policy).

Stakeholder input was of critical importance in the development of this strategy, and the outcome of the consultation strongly influenced the strategic actions. Working in partnership, it is intended that with continued stakeholder engagement, the outputs of this strategy will be co-designed and co-owned by all farming stakeholders.

Strategic Action 3 of NFABS proposes the development and publication of Codes of Practice for farm biosecurity and the use of risk assessment tools to measure how effectively they are applied. It asks that all stakeholders, including farm service providers, work together to develop sector-specific codes of practice appropriate to the degree of risk. For farmers, the code of practice will include a requirement for the development, implementation and regular review of farm specific biosecurity plans in close collaboration with their attending veterinary practitioner. Following the principle of 'you can't manage what you don't measure', the strategy recommends that the effectiveness of farm biosecurity plans should be measured, using standardised and validated biosecurity risk assessments. These are useful tools for assessing biosecurity status and indicating where changes in practice should be implemented.

Glossary of Terms

Acclimatisation – Gilts that you introduce to your herd from elsewhere must be acclimatised prior to mating. This period may last for up to 8 weeks and involves exposure of the incoming animals to the resident animals. This acclimatisation allows the gilts to adjust to your feed, housing and management system but above all to those pathogenic organisms present in your herd to which they may have no immunity.

Hygiene lock – Separate room or part of a room where staff and visitors apply biosecurity measures such as changing clothes or putting on protective clothing, washing and disinfecting hands, changing footwear, taking a shower, etc, before entering the premises or when moving between different units or compartments. A hygiene lock must be located at the entrance to and ideally also between the different units and it should be as effortless as possible to use.

Hygienograms – Surface bacterial counts that are used to monitor the efficiency of cleaning and disinfection of the empty house between production cycles.

Quarantine – New breeding stock should be isolated from the herd for a time period which depends on the incubation period of the pathogens of concern and the herd's health status. During the quarantine period pigs should be clinically inspected to ensure that no signs of disease are present. Pigs can also be tested in order to detect any current infections and assess previous exposure to pathogens. The purpose is to prevent introduction of pathogens into the farm.

Fomites – Inanimate objects or materials which are likely to carry pathogens, such as clothes, boots, shovels, equipment.

Vectors – Living organisms that transmit an infectious agent from an infected animal to another animal or human.

1. Introduction to the Biosecurity Code of Practice for Indoor Commercial Pig Farms

1.1 Definition of Biosecurity

Biosecurity is a set of preventative practices designed to reduce the risk of introduction and spread of disease agents, the objective being that 'prevention is better than cure'. Biosecurity practices can be implemented at different levels such as country, region, herd and even individual animals. In addition to providing the correct infrastructure, implementing biosecurity measures involves adopting a set of attitudes and behaviours to reduce risk in all activities involving animal production and care. Biosecurity can be subdivided into two main components: external biosecurity or bio-exclusion which aims to keep pathogens out of the herd; and internal biosecurity or bio-management which focuses on preventing the spread of pathogens within herd (Dewulf and Van Immerseel, 2019).

1.2 Aim of the Code

The aim of this Code of Practice is to provide practical guidance on the national standard of biosecurity required to be implemented by the pig industry at farm level to prevent and control the spread of exotic and endemic swine pathogens and zoonoses in Ireland.

1.3 Scope of the Code and Target Audience

This Code of Practice is a comprehensive voluntary document designed to provide guidance on biosecurity for all indoor commercial pig farms in Ireland.

The scope of this Code of Practice covers the breeding and production of pigs from birth to maturity or sale and acknowledges that some farms are part of larger integrated multi-site production systems with common health status and biosecurity practices.

It was developed to address the main pathogens causing disease in pigs and those related to food safety and human health.

It is intended that pig farmers will incorporate the Code of Practice into their farm-specific biosecurity plans.

The code is intended for use by pig producers (owners, managers and farm staff), their attending veterinarian and those visiting indoor commercial pig units on a regular basis, including advisors and personnel from firms providing services such as feed, artificial insemination and transport.

1.4 Biosecurity Principles

Measures and procedures applied at farm level to reduce the risk of pathogen introduction, and those applied within a farm to reduce the risk of pathogen spread, can be grouped under five general principles (Dewulf and Van Immerseel, 2019):

- ✓ Separation: to avoid disease transmission, it is important to try to keep sources of infection separate from susceptible animals/contacts. This can be achieved by preventing direct contact between high risk and low risk animals as well as by preventing indirect contact. Whenever contact between high and low risk animals or compartments cannot be avoided, precautionary measures should be implemented.
- ✓ Reduction: even with the best possible biosecurity, it is not possible to keep animals in sterile conditions. Therefore, the goal of biosecurity is to keep infection pressure below a level which allows the natural immunity of the animals to cope with infections. Biosecurity is not a matter of "all or nothing" but a matter of reducing the infection pressure as much as possible.

- ✓ Focus: not all transmission routes are of equal importance. Direct animal contact is much more efficient in disease transmission than transmission through feed or other routes. Therefore, when developing farm specific biosecurity plans, it is important to place more focus on high risk transmission routes than on lower risk transmission routes. These may vary, depending on the pathogen involved.
- ✓ Repetition: risk is a combination of probability of transmission and frequency of occurrence of an event. If a certain transmission route such as transmission via the hands of farm staff has a low probability of disease transmission but handling is repeated frequently as when staff touch the animals several times a day without precautionary practices, the risk of disease transmission becomes substantial. Therefore, when developing farm biosecurity plans, it is important to focus on actions that are repeated frequently even if they are considered of low risk.
- ✓ Scaling: larger animal groups pose higher risks. Larger groups of animals contain more animals that may be infected, maintain an infection cycle and increase the infection pressure over the limit that the animals can cope with. Larger herds also have more frequent contact with the outside world, which increases the risk of disease introduction.

1.5 Major Routes of Pathogen Transmission

Direct routes of contamination refer to the transmission of pathogens between pigs through pig-to-pig contact, semen and embryos. Indirect routes of contamination refer to the transmission of pathogens between infected and non-infected pigs through vectors and fomites (including people, equipment, vehicles, etc).

Table 1 summarises the main sources and routes of transmission of pathogens indicating whether external or internal biosecurity measures or both are important in limiting transmission.

Table 1. Main sources and routes of transmission of pathogens.

SOURCE OF INFECTION	MEASURES THAT LIMIT TRANSMISSION OF INFECTION	
	External Biosecurity	Internal Biosecurity
› Introduction of Pigs	X	
› Semen	X	
› People	X	
› Other Livestock	X	
› Pets	X	
› Wildlife	X	
› Sick Pigs		X
› Pig Flow		X
› Worker Hygiene	X	X
› Environmental Hygiene		X
› Disposal of dead pigs	X	X
› Pests	X	X
› Fomites including vehicles, equipment	X	X
› Animal feed	X	X
› Food for workers	X	X
› Manure	X	X
› Aerosols/dust/ wind	X	X
› Water	X	X

1.6 Biosecurity Levels

The Code of Practice is organised in two specific sections:

Level 1: Routine Biosecurity Procedures

These procedures should be implemented and followed on a daily basis. The Code of Practice aims to promote best practice to ensure that pathogens are not carried into pig production areas and to reduce the risk of transmission between production areas.

Level 2: Enhanced Biosecurity Procedures for High Risk Contingency Situations

In the event of introduction, or an elevated risk of introduction (for example the detection of ASF in the UK), of an exotic, emergent or serious endemic disease higher level risk biosecurity procedures should be implemented.

2. National Pig Biosecurity Code of Practice

2.1 Level 1: Routine External Biosecurity Procedures



2.1.1 Incoming Pigs and Pig Products

The most common route of introduction of infectious diseases is by incoming pigs. Under Irish production systems, movement of weaners onto a finishing unit is the most common event involving the introduction of pigs into a site. Introduction of breeding stock may occur in some units also, although most farms breed their own replacements. Semen is also a possible source of introduction of pathogens.



2.1.1.1 Limit the Frequency of Introduction

- ✓ Both the frequency of introduction and the number of animals/animal products (e.g. semen) purchased will influence the risk of disease introduction. Minimize these.

2.1.1.2 Limit the Number of Sources

- ✓ The number of source herds should be minimised, a single source of animals/animal products being preferred.
- ✓ Introduce only animals/animal products of known and acceptable health status. Recent veterinary reports should be sought from the source herd including, for example, findings of clinical inspection of pigs, absence of lesions at slaughter and results of relevant laboratory tests. However, these are not a guarantee of the absence of disease, merely that its presence was not detected.

2.1.1.3 Implement Good Quarantine Measures

- ✓ All new breeding stock should be isolated from the herd for a time period which depends on the incubation period of the pathogens of concern and the herd health status. Consult your veterinarian about what is the best isolation period for your herd. Isolation periods can range from 4 (for example for swine dysentery) to 12 (for example for *Mycoplasma hyopneumoniae* – most common pathogen in the porcine respiratory disease complex) weeks. Quarantine periods usually last for 4 weeks for most herds and may then be followed by another period of acclimatisation (see Section 2.2.1).
- ✓ The isolation facility should be at least 1km from the rest of the herd and preferably >2km from the nearest pig farm, have its own unloading facility and be positioned so that surface drainage and prevailing winds do not carry contamination to the rest of the herd. As a rule of thumb, the isolation facility should be far enough away so that it is not easily accessible to staff as they perform their regular duties. Entry of personnel to the isolation area should include use of a hygiene lock. In cases of pig farms in pig dense areas, air filtration systems are proven to reduce the risk of pathogen introduction. Tests for diseases of specific interest should be carried out before the isolation period ends. Negative test results should be received before animals are released from isolation. Moreover, the quarantine period can be used to start preventive treatments such as vaccination, in preparation for moving to the herd. Please consult your veterinarian.
- ✓ If importing animals from outside of Ireland the Irish import protocol as defined by the industry should be implemented.



Biosecurity Risks



Good Biosecurity Practices



2.1.1.4 Semen

The risk of introduction of pathogens (e.g. PRRS virus) through semen has been documented for several pathogens (see Appendix I). To avoid this occurrence:

- ✓ Semen should be purchased from a boar stud with an appropriate health status.
- ✓ Request confirmation of the health status of the boar stud, ensuring that regular testing is conducted for relevant pathogens (see Appendix I).
- ✓ Verify that pig transport companies have appropriate biosecurity protocols for delivery vehicles and drivers.
- ✓ Use barriers and packaging protocols to avoid cross-contamination on delivery of semen.
- ✓ Delivery personnel should not make contact with farm staff e.g. handshake.
- ✓ Goods must not be placed on floor surfaces, which may be contaminated by footwear of staff and/or visitors.
- ✓ Packaging should be disposed of outside the farm.
- ✓ Where high level biosecurity is required, deliveries should be made to a neutral location outside the perimeter fence and the use of pass-through windows avoided.
- ✓ If semen is imported from outside of Ireland, follow the procedures advised by national bodies referring to imported semen.



2.1.2 Transport of Pigs to/from the Farm, Removal of Manure and Deadstock

Pathogens can spread through the transport of live animals, the removal of deadstock and manure. Pathogen spread can happen by direct contact with diseased animals and deadstock or indirectly through fomites (e.g. rendering truck, lorries, manure, etc.).



2.1.2.1 Use Clean Animal Transport Vehicles

- ✓ Put specific sanitation protocols in place for incoming vehicles. Verify and record that vehicles are empty and have been cleaned and disinfected before allowing entrance to the farm. Ensure that enough time was allowed for proper drying after disinfection.



2.1.2.2 Ensure Physical Separation of the Clean and Dirty Areas of the Farm

The distinction between the clean and dirty area of a pig farm provides a clear separation between clean and the dirty (risky) sections of the premises. All inbound and outbound traffic that serves multiple companies/farms should always go via the "dirty road". The "clean road" is for internal animal movements and delivery of low risk products in fully cleaned and disinfected lorries.



- ✓ The vehicles performing the following operations should operate from outside the perimeter fence or from the dirty area of the farm:
 - » Vehicles carrying live pigs,
 - » Collecting dead pigs,
 - » Removing manure.



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2.1.2.3 Management of Deadstock

Deadstock are a major source of infectious material. Animals often die due to infections and thus there is great potential to transmit pathogens from carcasses and associated material.



- ✓ Remove deadstock from the pens as soon as possible.
- ✓ All procedures relating to the handling, storage and disposal of deadstock must be in accordance with current legislation and good biosecurity practices.
- ✓ Implement procedures for handling, temporary/final storage and removal of dead pigs to prevent any contamination of feed and water sources, housing areas and/or the external environment (e.g. maintain leak-proof containers located outside of production area).
- ✓ Make sure that no vermin can reach the deadstock as they could spread infectious material.
- ✓ Ideally, fallen animals and biological wastes (afterbirths etc.) should be brought to a collection point well outside the farm perimeter where loading can occur. Storage pending collection should be in secure leakproof covered skips labelled "Category 2 Not for Animal Consumption". This skip should be cleaned, washed, disinfected and allowed to dry after each collection. Runoff of infected bodily fluids from carcasses from dead pig storage and collection areas should be avoided at all costs.
- ✓ Farm equipment used to remove deadstock from the farm must be sanitised after each collection.
- ✓ Handle deadstock appropriately: use gloves when handling dead animals and replace them frequently.



2.1.2.4 Management of Manure

Manure is a high risk source of pathogens. Pathogens in manure can be spread by direct contact, by air, or on people, equipment and vehicles. Plan manure management according to national regulations ([Regulation \(EC\) No 1069/2009 of the European Parliament and of the Council of 21 October 2009 laying down health rules as regards animal by-products and derived products not intended for human consumption and repealing Regulation \(EC\) No 1774/2002 \(Animal by-products Regulation\) \(europa.eu\)](#)).



- ✓ Collect, contain and use manure away from the herd or animal groups and in a manner that prevents access to scavengers and pests. It should be spread preferably on land away from pig farms (ideally tillage and if not, grassland).
- ✓ It is essential that manure be kept below the level of the slats at all times (0.3m at a minimum) for control of all pathogens spread by the faecal-oral route and other husbandry reasons. Ventilation experts should be consulted if problems with poor lying patterns and poor pig cleanliness are experienced.
- ✓ Implement a sanitation plan that includes staff, equipment and vehicles used to remove manure.
- ✓ The spread of liquid manure originating from other farms in the neighbourhood of the farm should be avoided.



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2.1.3 Supply of Feed, Bedding, Water and Equipment

The water system (water source, storage, delivery and treatment system) can be a source of pathogens. It can become contaminated with faeces from contact with pigs or other animal species. Prevention and control measures can minimise if not eliminate this risk. Sources of water that are susceptible to pathogen contamination include surface water (e.g., puddles, reservoirs, ponds, lakes and rivers), groundwater aquifers and rainwater collection systems. Surface water systems pose a significantly higher risk for the introduction of infectious organisms and undesirable substances and are not recommended for use without a functioning treatment system.



- ✓ Use a water treatment system, if needed, and maintain water systems in good repair.
- ✓ Have appropriate drainage in place to prevent contamination by water used for cleaning activities.
- ✓ Regularly (at least once a year) test the water quality (at the source and at the drinking point for the pigs) and treat water, if necessary, and record results.
- ✓ Regular cleaning of the water pipes is advisable to avoid formation of biofilms (a type of slime layer where pathogens proliferate).



Compared to other routes of infection, transmission of pathogens through feed is a lower risk source of infection, if proper hygienic conditions are in place. However feed may be contaminated post-production and during transport, or by exposure to rodents and birds on the property. Bacteria and mould in poor quality or damaged feed may also be a concern. Feed and bedding can easily be contaminated directly or indirectly by insects, rodents or wild animals and other species at any stage of production.



- ✓ Purchase from a trusted source. Request details from the feed supplier of their feed-borne pathogen control programme and test results for feed supplied.
- ✓ Feed and bedding areas/storage should be properly maintained.
- ✓ Feed lorries should operate from outside the perimeter fence.
- ✓ Confirm feed suppliers have HACCP protocols/records in place and that their protocols are adequate, effective and implemented.



Incoming material, including equipment and supplies (e.g. shovels, equipment in contact with manure, etc.), may act as fomites carrying pathogens onto farms and equipment may also contribute to transmission within the farm.



- ✓ Dedicate equipment for use only within a particular production area, house, farm or system flow.
- ✓ Establish protocols for cleaning and disinfecting equipment/material that is shared between production areas, houses, farms in the sanitation programme.
- ✓ Regularly check and record the use and maintenance of equipment.



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2.1.4 Access of Personnel and Visitors

Humans can be the primary carrier and/or act as a mechanical vector of pathogens if they have been in direct or indirect contact with infected animals and subsequently come into direct or indirect contact with susceptible animals without taking any preventive measures. Transmission occurs mainly through remains of excretions or secretions (oral fluids, nasal discharge) from infected animals on footwear and clothing.

Although the highest risk route of disease introduction into a herd is the movement of live animals, there is a risk of disease introduction by people travelling between farms or between groups of animals. This risk varies considerably and is influenced by:

- ✓ *the specific disease agent involved,*
- ✓ *the extent of the previous and subsequent animal contact,*
- ✓ *the time elapsed since the last animal contact,*
- ✓ *the preventive measures used.*



Visitors:

- ✓ Limit the number of people with access to houses: only personnel essential to the operation of the farm should be allowed access. To do so, provide clear signage that prohibits visitors from entering without permission from the farm manager, and a phone number for the farm contact person.
- ✓ The visitor car park should be located outside the perimeter fence.
- ✓ Visitors should sign the visitor's book and record date and place of last pig contact.
- ✓ Pig 'free' time: the visitor must not have been on another pig farm within a specified period agreed with the farm owner or manager in consultation with his veterinarian. This period will vary depending on the health status of the unit. In the case of high health (minimal disease) units this period will be at least 12 hours (overnight away from pigs) and ideally 72 hours in the case of nucleus breeding herds. Note: this requirement does not replace other requirements such as visitors wearing farm-specific clothes and boots.
- ✓ Utilise a hygiene lock entrance to the houses. In this hygiene lock a clear separation (e.g. bench) between dirty and the clean areas should be provided. When entering the hygiene lock the following steps should be observed:
 - » Remove clothing and footwear.
 - » Wash and disinfect hands.
 - » Step over the bench and put on clean overalls and boots. The clean boots should have been disinfected.
 - » When returning to the hygiene lock, clean the boots with a boot washer and put them in disinfectant.
 - » Take off the dirty overalls and put them in the laundry basket.
 - » Step over the bench and wash your hands before you put on your own jacket and shoes again.
- ✓ Wear only farm specific clothes and boots or disposable overalls and boots/disposable plastic boots.
- ✓ Ideally shower-in (including hair).
- ✓ Visitors should not enter pens, passageways used for moving animals, or touch animals unless necessary.
- ✓ Visitors must not bring meat products with them onto the farm.
- ✓ Ask visitors to wash their hands when entering the farm and before leaving.
- ✓ It is good practice to provide and wear disposable gloves and dust masks in all pig housing areas.



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- ✓ If cameras and phones are to be brought inside the farm, they must be disinfected (i.e. use disinfection wipes) or provide bags for their storage and use.
- ✓ Inform all visitors of your biosecurity requirements before arrival on farm.
- ✓ Assess the risk posed by different categories of visitors and implement appropriate biosecurity procedures for each risk category of visitor (see Appendix II).

Staff:

- ✓ Staff should be very familiar with and fully trained in the biosecurity and management protocols on farm.
- ✓ Staff should be provided with clean farm-specific clothing/footwear and any personal equipment necessary which should not be used outside the farm.
- ✓ Clean, warm facilities for showering and changing clothes should be provided, with a plentiful supply of hot water, shampoo, soap and clean towels. These facilities should be kept to a high standard of cleanliness. Separate, secure storage lockers for clean clothing and work wear should be provided for each employee. Jewellery and watches are difficult to clean and should be left in the clean storage locker.
- ✓ Laundry facilities should be provided for washing and drying of work wear. Alternatively, a contract workwear firm should be used. Boots, overalls and personal protective equipment (ear protectors, goggles, dust masks) should be for the exclusive use of each individual and should be replaced regularly.
- ✓ Staff used in a relief role for more than one farm pose a high risk of conveying infection between farms, farm management must ensure that such personnel are aware of the risk they pose and stringently adhere to excellent biosecurity practices.
- ✓ Extreme care should be taken regarding off-site clothing and footwear. Protective clothing, boots and tools should never be moved between farms.
- ✓ Workers on pig farms should have no contact with pigs (including pet pigs) or pig manure outside of their employment.



Cured and/or fresh (uncooked) meat products pose a risk for the introduction of pathogens because meat may still contain animal pathogens despite processing. Imported meat products present a risk of introducing an exotic pig disease into Ireland.



- ✓ Where staff are permitted to bring packed lunches onto the premises, foodstuffs should not be permitted outside the canteen. From an ASF perspective, business owners should not allow pork products onto the premises to avoid accidental disposal to pigs.
- ✓ Feeding of waste food to pigs (including swill) is prohibited under S.I NO. 597 of 2001 as amended, and staff should be made aware of this.



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2.1.5 Pests

A number of pathogens can be directly or indirectly transmitted from outside the farm or between compartments within farm by rodents, birds, insects, dogs and cats. They can act as a reservoir for herd specific pathogens that will continue to circulate in the farm. Birds, insects and flies, when looking for feed, can come in close contact with pigs and may transmit infection, both in their faeces, e.g. birds and rodents, and by mechanical transfer.



- ✓ Maintain a secure perimeter fence around the buildings.
- ✓ Remove feed spills and manure accumulation.
- ✓ Ensure proper weed/grass control.
- ✓ Clean up debris.
- ✓ Manage storage of waste so that it does not attract pests.
- ✓ Ensure sanitation procedures are in place for waste including daily removal and storage.
- ✓ Routinely inspect facilities to ensure buildings are proofed to prevent access of animals (rodents, birds, etc.) and keep records to document that these inspections are conducted, and risk is minimised.
- ✓ Implement an effective pest control programme (including rodents, birds and insects). The use of cats and dogs to control rats and mice is not advised.
- ✓ Place grids/fences over all air intakes to prevent contact between wild birds and pigs.
- ✓ Keep domestic animals (cats and dogs) out of the pig units.



2.1.6 Location and Environment

The location of the farm and the density of pigs in the proximity are important factors that influence airborne and vector-borne disease transmission. Wild animals can also be a reservoir for pig pathogens.

2.1.6.1 Airborne Transmission of Pathogens

Aerosol transmission of some pathogens has been documented (see Appendix I). It is an important mode of transmission that should be considered in pig-dense areas for some key pathogens such as PRRSv, Mycoplasma hyopneumoniae, etc. The safe distance between farms varies depending on farm size, pathogen load, pathogen resistance to desiccation in the air, climatic conditions and local geography.



- ✓ Locate new facilities, particularly boar studs or breeding herds, in low pig density regions. The direction of the prevailing wind should also be taken into account.
- ✓ Knowledge of the health status of neighbouring farms is important.
- ✓ Verify the distance to your neighbour. Ideally you should be located at least 1km from other farms.
- ✓ Exercise care when cleaning units to ensure transmission of pathogens to pigs does not occur, e.g. when power washing.
- ✓ The spread of liquid manure originating from other farms in the neighbourhood of the farm should be avoided.
- ✓ High performance air filtration systems can prevent entrance of airborne pathogens. This could be an option for a farm free from several pathogens located in a pig dense area (when the farms in the neighbourhood are not free from these pathogens).

2.1.6.2 Wild Animals

- ✓ Ensure that facilities, fences and equipment are properly maintained to keep wildlife out and keep records of all maintenance and repairs.
- ✓ Pig units should have secure perimeter fencing to protect the herd from stray animals.
- ✓ The number of farm entrances should be kept to a minimum. Any door which is not used should be permanently closed. Farm access routes should be indicated clearly.



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2.2 Level 1: Routine Internal Biosecurity Procedures



2.2.1 Disease Management

Disease management concerns all actions related to the correct handling and treatment of diseased animals. This includes proper diagnostics, isolation of sick animals and record keeping, as well as improvement of the immune status of susceptible animals, for example, through vaccination. It is, therefore, important to have a Herd Vaccination Programme in place, which is implemented and reviewed frequently.

Diseased pigs are the major source of pathogens for other pigs. Biosecurity measures and procedures need to be adapted to the health status of the herd. A Herd Health Plan should be developed and reviewed frequently by the farmer and their veterinarian.



- ✓ Any occurrence of disease should be reported to the farm veterinarian.
- ✓ All new breeding stock should go through a period of acclimatisation. This period may last for up to 8 weeks and involves exposure of the incoming animals to the resident animals, the purpose being to allow naïve pigs entering the herd to develop immunity to endemic infections already present in that herd.



2.2.1.1 One Way Pig Flow

Pigs with a slower growth rate than the rest of the batch should not be held back and mixed with a younger batch. It is very likely that these slower growing piglets suffer from one or more infectious diseases and thus transferring them to a younger age group will spread that disease(s).



- ✓ Avoid transferring slower growing pigs to a younger age group. Euthanise these pigs or move them to the hospital pen or separate dedicated pig flow.



2.2.1.2 Recovery Pen/Sick bay

Diseased pigs should be isolated in the recovery pen/sick bay in order to protect susceptible pigs from exposure to pathogens. A good recovery pen should be completely separated from the rest of the animals and located in a separate house.



- ✓ Move sick pigs to a recovery pen.
- ✓ Do not house sick pigs with other healthy pigs, regardless of age.
- ✓ Euthanise sick, lingering and injured pigs not likely to recover, to minimise suffering and the spread of disease.
- ✓ Employees should be trained in safe, efficient and effective euthanasia methods. Ideally, a dedicated person, competent in euthanasia methods, should be assigned responsibility for euthanasia.



See the Teagasc Casualty Pig – Prevention of Unnecessary Suffering infographic and



FAWAC guidelines for emergency killing of pigs on farm.

- ✓ Define and implement adequate sanitation procedures for recovery pens.
- ✓ Provide dedicated equipment for recovery pens and the necessary hygienic measures (e.g. changing of overalls, footwear, washing hands, etc.) should be implemented when entering and leaving the recovery pens.
- ✓ All needles used for treatment of hospitalised animals should only be used once and then disposed of safely. To prevent transmission of infection to healthy animals, pigs in the recovery pen should be only attended to after all other pigs have been attended to first.



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2.2.1.3 Use of Needles and Medicines

On pig farms needles are often used on multiple occasions and are only replaced when they become blunt. These needles become contaminated by pathogens through use and storage. Injecting multiple animals with the same needle increases the risk of spread of pathogens.



- ✓ Ideally single use needles should be used.
- ✓ If not possible all multiple needle use should be confined to a single needle per litter or single needle per pen.
- ✓ Avoid using the same needles for different age groups and replace them before they become blunt.
- ✓ Medicines should be stored hygienically and within the recommended temperature range.
- ✓ They should not be used after their expiry date or beyond the recommended period after broaching/opening.
- ✓ Consult your veterinarian and the data reference sheets on the use of pharmaceuticals within the farm.



2.2.1.4 Farrowing and Suckling Period

Pathogens can be transmitted from sows to piglets. Cross-fostering increases the risk of transmission from infected or carrier sows to susceptible piglets without maternal antibodies and from piglet to piglet. Piglets are a vulnerable age group due to their temporary lower immune status. Another route of pathogen transmission in the farrowing house is the use of equipment (e.g. tail clippers, ear-tagger, iron injection needles) on multiple piglets without cleaning and disinfection.



- ✓ Treat for parasites, if testing has been conducted and there is evidence of parasitic infection on the farm, and wash sows before transfer to the farrowing house.
- ✓ Limit cross-fostering to one occasion and within the first 48 hours after birth.
- ✓ Clean and disinfect the equipment used for treating piglets between litters.



2.2.2 All In/All Out

Application of the all-in all-out (AIAO) principle helps to prevent cross-contamination and facilitates thorough cleaning and disinfection between consecutive production rounds. It is fundamental that this principle is fully respected.



- ✓ Houses should be operated on an all-in all-out basis.
- ✓ Pig flow should be in one direction only (keep moving forward, no pigs mixed with the batches following behind).
- ✓ Do not mix pigs of different ages.
- ✓ When moving pigs from one production stage to the next (e.g. from the farrowing house to the nursery pen) keep the groups together as much as possible rather than sorting all animals according to size. This will minimise mixing of animals and the likelihood of spread of pathogens.



2.2.3 Stocking Density

A high stocking density induces stress which results in an increased susceptibility to pathogens and increased excretion of pathogens. Overcrowding increases the opportunity for pathogen transmission between pigs, through closer and more frequent contact. The stocking density as prescribed by EU legislation is considered the absolute minimum (<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008L0120>). Optimal stocking densities are more generous (higher) than the legal requirements.



- ✓ Provide adequate space for animals to thrive. The minimum space is set by Council Directive 2008/120/EC.



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2.2.4 Compartmentalisation and Working Lines

Animals of different ages may have different levels of susceptibility to certain pathogens and different infection levels/loads. It is therefore crucial to keep different groups separate and to work in a well-defined sequence. Equipment and materials (e.g. bedding material, feeders, drinkers, boots, tools, syringes, needles, etc.) may also play an important role in the transmission of diseases.

2.2.4.1 Working Lines and Separate Hygiene Locks

The way pigs are managed within a farm can increase or decrease the risk of disease spread. In general, diseases within a herd spread from older to younger animals.



- ✓ Farm sections should be physically separated from each other and have a hygiene lock.
- ✓ Ideally staff within the farm should be restricted to dedicated areas and not move between different production stages. Casual movement should be avoided. If the unit is too small to have staff dedicated to each production area, the following basic internal biosecurity principles should be followed:
 - » Have a working protocol to look after younger animals first, then older animals.
 - » Look after healthy animals before checking on sick animals.
 - » Provide section specific clothing and footwear (preferably with a unique colour for every section).
 - » Install physical barriers to prevent unwanted movements.
 - » Follow good hygiene practices at all times (washing hands, wearing of gloves, etc.).
- ✓ Depending on the size of the farm, toilet and handwashing/hand sanitisers facilities should be strategically located throughout the farm and not restricted to the changing area.

2.2.4.2 Equipment in the Various Compartments

- ✓ Sections housing different production stages should not share equipment. Each section should have its own equipment. The equipment should be clearly recognisable (e.g. different colours per section) to avoid moving it from one section to another.
- ✓ If equipment is shared between production areas, ensure that it is used sequentially in younger animal sections first and then in older animal sections and proper cleaning and disinfection protocols are implemented.
- ✓ Ensure that equipment used in quarantine areas is dedicated to the quarantine area only and is NOT used elsewhere.
- ✓ Ensure proper sanitation in storage of medical supplies and equipment.
- ✓ Hand tools and items such as needles, syringes, bottles of medication, etc. should be stored properly in each section of the farm and not moved between sections.



2.2.4.3 Boot Washers and Disinfection Baths

To avoid spreading pathogens through footwear, boot washers and disinfection baths should be placed between the different production sections. Effective disinfection can only be achieved if dirt and faeces are removed from boots before applying the disinfectant.



- ✓ Install hand washing/boot washing facilities throughout the farm and between sections.
- ✓ A brush should be located at these points to assist with removal of heavy dirt from footwear. Wellington boots are preferable to work boots because of ease of cleaning. Selection of work boots should take account of ease of cleaning.



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- ✓ The use of foot baths is an unreliable method of routine disinfection, unless boots are thoroughly scrubbed before immersion and adequate contact time in the disinfectant is permitted. Usually at least five minutes contact time is required. This might not be practical. To avoid this waiting time, provide an extra pair of boots at each disinfection bath ready to be used while the other boots are placed in the disinfection solution.
- ✓ Disinfectant solution in foot baths should be changed regularly in accordance with manufacturer's instructions.
- ✓ Place a cover over outdoor foot baths, to avoid dilution of the disinfectant solution by rain.



2.2.5 Cleaning and Disinfecting

Pens, feeders, drinkers and other equipment contaminated with faeces and other bodily secretions (saliva, nasal discharge, urine) can maintain an infection cycle because newly introduced animals acquire infection and subsequently re-contaminate their environment. To break the infection cycle between consecutive batches, pens and equipment should be thoroughly cleaned and disinfected between each production cycle. Inadequate hygiene procedures can contribute to the maintenance of disease on a unit.



- ✓ Subdivide houses to facilitate emptying, washing and operation of all-in all-out systems.
- ✓ Assess the ventilation system and adjust settings as required to provide appropriate air flow and quality.
- ✓ Poor ventilation may result in increased microbial load. Drafts may chill pigs, which may increase susceptibility to disease.
- ✓ Clean, wash, dry, disinfect and dry animal pens and equipment, including feeders and drinkers, before pigs are introduced into the facilities.
- ✓ Check the efficacy of the cleaning and disinfection procedure by using hygienogram or contact plates. These plates measure and quantify the presence of bacterial contamination.
- ✓ Proper cleaning and disinfection procedures should include:
 - » Removal of all organic material.
 - » Soaking all surfaces, preferably with detergent solution. Pre-soaking using an automatic sprinkler system will reduce water usage and washing time.
 - » High-pressure cleaning with water to remove dirt. Watch the water temperature!! Better results with higher temperatures (i.e. 60°C).
 - » Drying the pens to avoid dilution of the disinfectant.
 - » Disinfecting the pens to achieve a further reduction in the concentration of pathogens.
 - » Drying the houses to ensure that animals cannot come into contact with pools of remaining disinfectant afterwards.
 - » Disinfectant should be allowed contact time to act and allow floors and walls to dry before re-stocking the pens. Adequate contact time and drying are both highly important in reducing infection levels.
 - » Testing the efficacy of the procedure through surface sampling.
 - » If test results are not satisfactory repeat the cleaning and disinfection procedure.



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2.3 Level 2: Enhanced Biosecurity Procedures in Contingency Situations

Measures to increase biosecurity protection by minimising movements on and off the property, and to protect the property from the increased threat of a disease being introduced in a suspected outbreak of an exotic disease or a serious endemic disease:



2.3.1 Measures to be Taken by Uninfected Herds to Minimise the Risk of Introduction of Infection

The primary purpose of these measures is to prevent infection entering the farm.



Facilities

- ✓ Gates must be kept locked.
- ✓ House doors must be locked at night.
- ✓ Facilities for the cleaning and disinfection of equipment coming on and off the production area must be in place.

Visitors

- ✓ No visitors are to enter the production area unless absolutely essential (e.g. veterinarian, essential maintenance staff).

Operational

- ✓ Essential visits—head-to-toe shower before and after visit. A complete change of clothes and footwear is required and hair covering and breathing protection must be worn. Used clothing and all used personal protection equipment must remain on the property.
- ✓ Any vehicles which enter the property must be washed and disinfected at the wash pad (or appropriate area) on entry and exit, e.g. feed lorries, etc. The inside of vehicle driver cabins must also be sanitised.



2.3.2 Measures Preventing Onward Transmission of an Exotic Disease from a Potentially Infected Site

The primary purpose of these measures is to prevent infection leaving an infected farm.

In addition to the measures described in the section above, the following measures should be implemented:



- ✓ DAFM must be contacted immediately in the event of a suspected outbreak of a notifiable disease ([S.I. No. 130/2016- Notification and Control of Diseases affecting Terrestrial Animals \(No. 2\) Regulations 2016. \(irishstatutebook.ie\)](#)). Where a notifiable disease is suspected no people, animals, manure, equipment or any other thing capable of spreading disease should be allowed on or off the premises until an investigation led by DAFM has been conducted. All DAFM instructions must be followed.
- ✓ Any necessary movements of personnel, equipment or feed onto a site potentially infected with an exotic notifiable disease must be pre-authorised by DAFM and moved under licence subject to stringent biosecurity procedures.
- ✓ Repairs should be confined to emergency works only which, if not carried out, will further impact the health and welfare of the pigs (i.e. no routine maintenance). Such necessary movements of maintenance staff will also be subject to movement authorisation and licensing.
- ✓ Each owner must establish and document clear guidelines regarding the circumstances when an exotic pig disease alert should be raised, e.g. unusual or unexplained disease pattern, an unusual increase in mortality or drop in production, and who must be informed. The action plan must also clearly state that, if an alert is raised, movement of pigs must cease immediately, as well as any other movements on and off the premises.
- ✓ Essential visits: changing into personal protective equipment (PPE) should take place outside the farm perimeter. Used clothing and all used personal protection equipment must remain on the property.



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Conclusions

Prioritising and strengthening biosecurity measures will minimize the risk of disease introduction and spread. Biosecurity measures do not replace the necessity to be prepared and to provide adequate resources to control disease outbreaks once they occur. However, biosecurity is a proactive concept, has a preventive impact and enables farmers to protect their farms from disease and to improve pig health and welfare. There is no 'one size fits all' approach to biosecurity as the circumstances of each farm or premises are unique. Therefore, biosecurity measures must be tailored to each individual setting. Biosecurity can require a change in mindset and must be implemented consistently by all those with access to pig premises. Biosecurity is only as strong as the weakest link. Biosecurity is about preventing disease from getting into a premises but also in the event of an outbreak, minimising spread within a premises and ensuring that disease does not get out to infect other pigs.

The National Pig Biosecurity Code of Practice will evolve in response to industry developments and needs.

References

Dewulf, J.; Van Immerseel, F. Biosecurity in Animal Production and Veterinary Medicine; CABI: Wallingford, UK, 2019




Appendix I – Transmission Routes for the Main Pig Pathogens

(adapted from Dewulf and Van Immerseel, 2019)





































Biosecurity Code of Practice for Indoor Pigs

PATHOGENS	DIRECT CONTACT	INDIRECT CONTACT									
		People	Semen	Manure	Domestic/ feral animals	Rodents	Insects (vectors)	Aerosol	Animal Feed	Water	Fomites
► <i>Actinobacillus pleuropneumoniae</i> (APP)	X				X			X		X	X
► <i>Bordetella bronchiseptica</i>	X				X	X	X	X		X	X
► <i>Brachyspira hyodysenteriae</i>	X	X		X	X	X	X		X	X	X
► <i>Brucella suis</i>	X	X	X	X	X		X	X	X		
► Classical swine fever	X	X	X	X	X		X	X	X		X
► <i>Clostridium perfringens</i> Type C	X			X			X	X		X	X
► <i>Erysipelothrix rhusiopathiae</i>	X			X							
► <i>Escherichia coli</i>	X	X		X	X	X	X	X	X	X	X
► Foot-and-mouth disease virus	X	X	X	X	X			X	X	X	X
► <i>Haemophilus parasuis</i>	X				X						
► <i>Lawsonia intracellularis</i>	X			X	X	X	X				X
► Leptospires	X	X	X		X	X				X	
► <i>Mycoplasma hyopneumoniae</i>	X	X			X			X		X	X
► <i>Pasteurella multocida</i>	X	X		X	X			X		X	X
► Porcine circovirus type 2	X		X	X	X	X	X		X	X	
► Porcine epidemic diarrhoea virus	X	X		X	X						
► Porcine parvovirus	X						X		X	X	X
► Porcine reproductive and respiratory syndrome virus (PRRS)	X	X	X	X	X	X	X	X	X	X	X
► Pseudorabies virus	X		X	X	X	X	X	X		X	
► <i>Salmonella spp.</i>	X	X		X	X	X	X	X	X	X	X
► <i>Streptococcus suis</i>	X	X		X	X		X	X		X	X
► Swine influenza virus	X	X		X	X			X			
► Swine vesicular disease virus	X	X	X	X	X			X	X		X
► Transmissible gastroenteritis virus	X	X		X	X		X				X

Appendix II - Assessing the Risk from Visitors

 HIGH-RISK VISITORS	Those who come into direct contact with pigs in their work and include vets, hauliers, advisors, consultants, maintenance workers who enter pig houses, manure spreading personnel, meat factory workers, quality assurance personnel and persons who work on other pig farms. These people typically have direct contact with animals and/or their bodily discharges
 MODERATE RISK VISITORS	Include those people who routinely visit farms, but who have little or no actual contact with animals. These include salesmen, feed and fuel delivery drivers and maintenance workers who do not enter pig houses.
 LOW-RISK VISITORS	Include those from urban areas or those who have had no recent livestock contact (last several days).

Lighter to stricter measures should apply according to the risk posed by visitors. All visitors, regardless of risk, should comply with minimum biosecurity practices laid out by your farm. Here are common practices to follow according to risk (see colour code):

RISK STATUS OF VISITORS	BIOSECURITY MEASURES/PRACTICES FOR VISITORS
  	Sign visitor's book. Include name, contact detail and date of last pig contact.
  	Visitors must wear clean farm-specific clothing or disposable overalls and boots/disposable plastic boots. Do not let visitors enter with their own shoes or boots!
  	<u>Showering</u> including hair and changing to clean clothes and boots. Secure storage lockers should be available for visitors. Jewellery and watches should be left in these lockers. If you do not have showers installed, at a very minimum all visitors must <u>wash hands</u> before entering the farm.
  	Visitors should not enter pens, passageways used for moving animals, or touch animals unless necessary.
  	Visitors must not bring food with them onto the farm.
  	Ask guests to wash their hands before leaving.
  	It is good practice to provide and wear disposable gloves and dust masks in all pig housing.
  	If cameras and phones are to be brought inside the farm, require their disinfection (i.e. use disinfectant wipes) or provide bags for storage and use.
 	Any sampling, measuring or recording equipment should be properly cleaned and disinfected between uses.
 	Vehicles should be clean and free of visible manure on the tyres and wheel arches and should be kept away from animal areas and driveways used by the farm's own vehicles.
	In an emergency disease situation, restrictions on access to the farm should be in place and washing and disinfection of vehicles should be compulsory.
	Livestock trucks and trailers should be clean, dry and disinfected, before arrival on the farm. The livestock truck should only serve one pig farm to reduce the risk of disease spread from another pig farm. Drivers should not enter the pig farm and farm staff should not ascend the truck loading ramp.
	In areas where diseases are a threat to the farm health status the farm manager should discuss with feed suppliers etc. the rota in which the pig farm is visited, and vehicles should receive extra cleaning after visiting high risk (i.e. infected) farms. Mud on wheel arches can carry infection.
	A stock of appropriate tools, extension leads and equipment should be kept on the farm to minimise use of tools and equipment which have been used on other pig farms.
	Equipment and instruments that have direct animal contact should be cleaned and disinfected (or sterilized) after use and maintained in such a way that they do not become re-contaminated.
	Disposable sleeves/gloves, other disposable clothing, or clothing that can be disinfected should be worn whenever there is the possibility of direct contact with bodily discharges, animal faeces or animal tissues.
	Before leaving the farm, dirty equipment must be cleaned and disinfected with an appropriate chemical agent.
	Manure spreaders should be cleaned before entering a new pig farm to start work. They should not enter premises where manure from another farm is stored or spread and should not travel over areas to which pigs have access or which are used by staff during the daily pig farm operations.

THIS DOCUMENT HAS BEEN PREPARED BY THE ANIMAL HEALTH IRELAND PIG HEALTHCHECK TECHNICAL WORKING GROUP AND APPROVED BY THE PIG HEALTHCHECK IMPLEMENTATION GROUP.

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